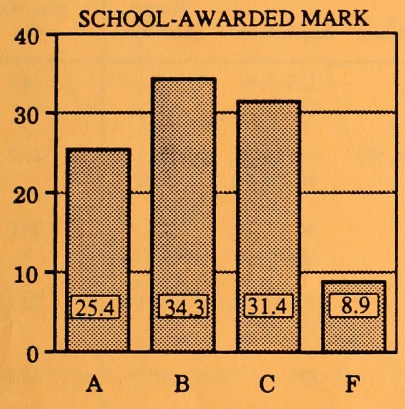
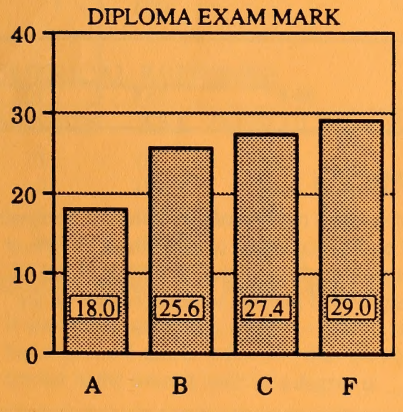
Students First!

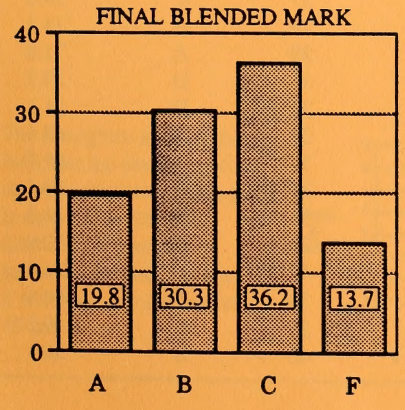
EXAMINERS' REPORT
JANUARY
1991

Student Evaluation

Mathematics 30 Diploma Examination Results







The summary information in this report provides teachers, school administrators, students, and the general public with an overview of results from the January 1991 administration of the Mathematics 30 Diploma Examination. The information is most helpful when used in conjunction with the detailed school and jurisdiction reports that have been mailed to schools and school jurisdiction offices. An annual provincial report containing a detailed analysis of the combined January, June, and August results will be available by the end of 1991.

DESCRIPTION OF THE EXAMINATION

The Mathematics 30 Diploma Examination consists of three parts: a multiple-choice section of 40 questions worth 61.5%, a numerical-response section of 12 questions worth 18.5%, and a written-response section of three questions worth 20%.

ACHIEVEMENT OF STANDARDS

The information reported is based on the final blended marks achieved by 9 232 students who wrote the January 1991 examination.

- 86.3% of these students achieved the acceptable standard (a final blended mark of 50% or higher).
- 19.8% of these students achieved the standard of excellence (a final blended mark of 80% or higher).

PROVINCIAL AVERAGES

- The average school-awarded mark was 68.2%.
- The average diploma examination mark was 61.0%.
- The average final blended mark, representing an equal weighting of the diploma examination and school-awarded marks, was 65.0%.

Alberta
EDUCATION

SUBTEST RESULTS

When analysing any detailed examination results, please bear in mind that subtest results **cannot** be directly compared.

Machine scored: 32.2 out of 52

Written response: 7.5 out of 13

- Course Content
  - Trigonometry: 9.8 out of 16
  - Quadratic Relations: 8.2 out of 14
  - Sequences, Series, Limits: 8.2 out of 13
  - Statistics: 5.1 out of 8
  - Logarithms: 4.0 out of 7
  - Polynomial Functions: 4.3 out of 7

- Cognitive Levels
  - Knowledge: 2.9 out of 5
  - Comprehension: 12.5 out of 18
  - Application: 20.6 out of 33
  - Higher Mental Activities: 3.5 out of 9

EXAMINATION BLUEPRINT

Each question on the examination is classified in two ways: according to the curricular content area being tested and according to the cognitive level demanded by the question. The examination blueprint illustrates the distribution of questions in January 1991 according to these classifications. Numbers with square brackets [ ] indicate written-response questions, those with round brackets ( ) indicate numerical-response questions, and those without brackets indicate multiple-choice questions.

Reporting Category	Questions by Cognitive Level				Examination Emphasis (%)
	Knowledge	Comprehension	Application	Higher Mental Activities	
Trigonometry	3	4, 7, 9 (1)	1, 2, 5, 6, (2), [3]	8	24.6
Quadratic Relations	13	10, 15, 16, 19, (5)	11, 12, 17, 18, 20, (4)	14, (3)	21.5
Sequences, Series, Limits	21	22, 23, (6)	24, 25, 27, [1]	26, (7)	20.0
Statistics		28, 32, (8)	29, 31, 33, (9)	30	12.3
Logarithms	35	(10)	[2]	34	10.8
Polynomial Functions	37	36, (12)	38, 39	40, (11)	10.8
Examination Emphasis (%)	7.7	27.7	50.8	13.8	100

RESULTS and EXAMINERS' COMMENTS

The examination has a balance of question types and difficulties. It is designed so that students capable of achieving the acceptable standard would obtain a mark of 50% or higher and students achieving the standard of excellence would obtain a mark of 80% or higher. Future examinations will continue to require students to demonstrate clarity in their thinking as well as a higher level of thinking on a broader range of goals. Students will need to achieve these learner expectations if they are to be successful on the examination.

MULTIPLE CHOICE

QUESTION	KEY	DIFFICULTY*	QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY
1	D	85.8	14	C	40.9	27	C	58.6
2	B	85.9	15	D	60.9	28	A	74.4
3	C	53.0	16	C	78.9	29	A	71.0
4	C	69.1	17	C	51.8	30	D	59.3
5	B	65.9	18	B	50.2	31	D	51.1
6	A	66.1	19	A	63.7	32	D	48.5
7	C	75.3	20	A	41.8	33	A	61.2
8	B	48.0	21	C	64.4	34	B	29.1
9	B	54.9	22	A	77.4	35	D	34.3
10	D	77.9	23	A	63.4	36	A	72.9
11	B	68.0	24	A	73.1	37	C	74.5
12	D	72.8	25	D	78.2	38	C	74.8
13	B	66.4	26	B	45.3	39	B	59.5
						40	D	39.3

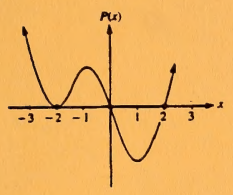
*Difficulty – percentage of students answering the question correctly

MULTIPLE CHOICE (continued)

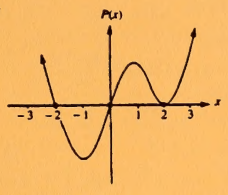
Students were expected to achieve the acceptable standard on all knowledge and comprehension questions — those questions that required students to apply one concept. Almost all students met this expectation. Students achieving the standard of excellence were expected to demonstrate a thorough knowledge of mathematics and to apply this knowledge to new situations. Questions 8, 14, 26, 30, 34, and 40 required students to apply their knowledge of mathematics to a new situation. An illustrative question follows.

40. The sketch that illustrates the graph of $P(x) = -a(x^3 - 4x)(x - 2)$, where $a > 0$, is

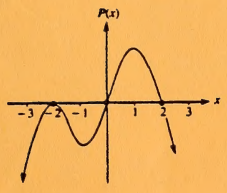
A.



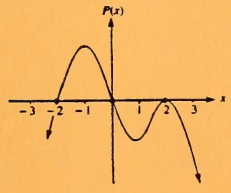
B.



C.



*D.



Question 40 required students to identify the relationship between the equation of a polynomial function and its graph. Students needed to read and interpret the factors of a polynomial function and determine the orientation of the graph, given a literal coefficient. Approximately 75% of all students were able to identify the orientation of the graph. It was expected that those students who achieved the standard of excellence would have no difficulty identifying the relationship between the factors of the polynomial and the x-intercepts of the graph. Only 60% of the students who achieved the standard of excellence were able to read the roots of the polynomial function from the equation and then identify the correct graph. Approximately half of the students who did not achieve the standard of excellence misinterpreted the factors of the polynomial function in determining the x-intercepts of its graph.

NUMERICAL RESPONSE

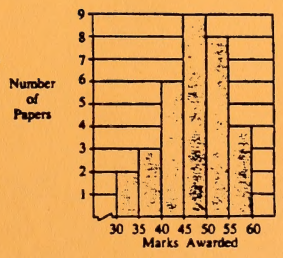
QUESTION	KEY	DIFFICULTY*	QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY
1	012.7	66.5	5	014.5	61.3	9	000.3 or 028.1	60.0
2	006.8	84.5	6	004.8	76.7	10	006.8	72.8
3	033.7	28.5	7	039.8	30.5	11	003.0	33.5
4	079.3	54.7	8	005.6	84.6	12	079.0	73.5

*Difficulty – percentage of students answering the question correctly

7. If the infinite geometric series $1 + \tan\theta + \tan^2\theta + \ldots$ has a sum of 6 and $0° < \theta < 90°$, then the measure of θ correct to the nearest tenth of a degree is _____.

Question 7 required students to determine the common ratio of a geometric series that involved the use of a trigonometric function and then to calculate the value of θ. Close to 75% of the students who achieved the standard of excellence were able to generalize and apply the concepts from both trigonometry and geometric series to solve this problem. Only 2.5% of those students who failed to achieve the acceptable standard were able to generalize the concepts from both content areas.

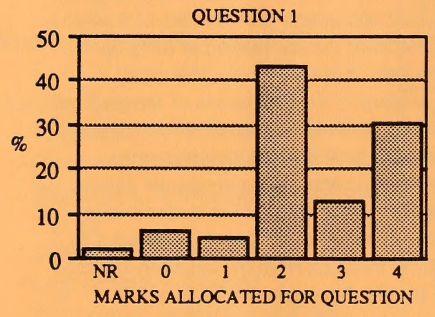
9. The histogram at the right indicates the marks awarded on an examination. One paper is drawn from the file. Correct to the nearest tenth, the probability that it will have a score between 45 and 50 is _____.



Question 9 required students to interpret a graph and to calculate the probability that an examination paper drawn at random would have a score between 45 and 50. This probability as a fraction was 9/32. Although the question implied that this final probability should be recorded as a decimal, 10% of the students identified this probability as a percentage. As the skill to be tested in this question was interpreting the graph and computing the probability as a fraction, recording the probability as 28.1% was accepted.

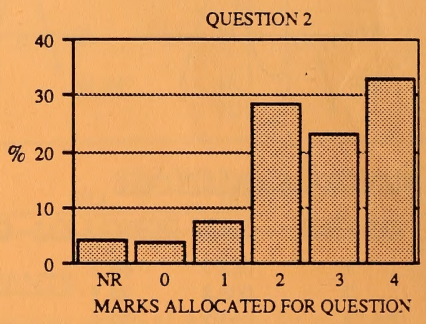
WRITTEN RESPONSE

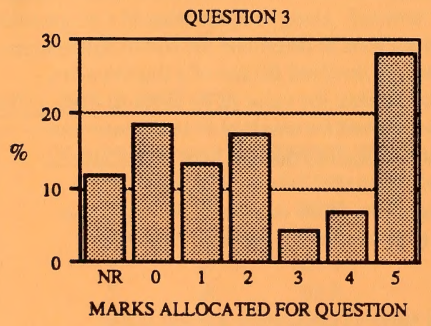
Questions in the written-response section dealt with three of the six content strands for Mathematics 30. Students performing at the acceptable standard were expected to obtain at least half marks on questions 1 and 2, and to be challenged by question 3. Students performing at the standard of excellence were expected to answer all questions almost perfectly.



Question 1 was answered well by most students. Students were first required to calculate the number of seats in the sixteenth row of seats in an auditorium. The second part of the question required students to calculate the number of rows of seats in the auditorium, given the total number of seats. Markers noticed that many students were able to calculate the number of seats in the sixteenth row but were confused as to how to approach the second part of the question. Approximately 69% of those students who failed to achieve the acceptable standard obtained at least half marks on this question. On this 4-mark question, the average mark was 2.52 for 63.0% of the available mark.

Question 2 required students to calculate the number of bacteria after a certain time and then to calculate the length of time that it would take for the number of bacteria to reach 43 000. Close to 45% of the students who achieved the acceptable standard were able to calculate both the number of bacteria and the length of time. Of the students who failed to achieve the acceptable standard, 5% were able to calculate both the number of bacteria and the length of time, and 42% were able to calculate the number of bacteria but then failed to recognize an approach to solving the second part of the question. In this particular question, markers noticed that some students rounded numbers off before the last step in the solution. These students lost one mark. On this 4-mark question, the average mark was 2.65 for 66.3% of the available mark.





Question 3 required students to prove a trigonometric identity. Close to 60% of the students who failed to achieve the acceptable standard received a mark of 0 on this question, whereas only 18% of the students who achieved the acceptable standard obtained a mark of 0. Markers noticed that many students were inconsistent with mathematical statements in this question; for instance, students would complete the proof without the use of θ's, use statements such as $\cos^2\theta = \cos\theta^2$, drop the denominator in initial steps of the proof and then pick up the denominator on the last step, or use the right-hand side of the identity in the proof. On this 5-mark question, the average mark was 2.28 for 45.6% of the available mark.

For further information, contact Florence Glanfield, Yvonne Johnson, or Phill Campbell at the Student Evaluation Branch, 427-2948.